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Welding unit equipped with a communications interface and method for operating the welding unit

The invention relates to a welding device of the type outlined in the generic part of claim 1, a method of operating a welding device as outlined in the generic part of claim 29 as well as a control and/or evaluation system for a welding device of the type outlined in the generic part of claim 35.

Methods of controlling welding devices and current sources as well as a control system needed for this purpose are known, in which various welding parameters such as a welding current, an additive, a welding method, etc., can be set from an input and/or output device and the control system operates the individual components of the welding device on the basis of the set welding parameters so that a user can start a corresponding welding process.

The underlying objective of the present invention is to propose a welding device and a method for operating a welding device, which can be remotely operated and by means of which status data can be determined remotely and maintenance carried out remotely.

This objective is achieved by the invention due to the characterising features set out in claim 1. The advantage of this system is that data can be forwarded to the welding device from a remote site and a data reading relating to the welding device or a welding process can be taken and transmitted over long distances. By incorporating a web server or HTTP server of the type known from the prior art, standardised software programmes can be used for the two-way data traffic, thereby ensuring compatibility with a whole range of connection possibilities such as data banks and the most varied of communication partners and communication equipment. Another advantage resides in the fact that this option of transmitting data remotely means that maintenance and software updates can be run remotely, as can access to external welding data banks in which special welding processes or welding settings are stored, thereby saving on the high travelling cost involved in sending a service engineer out.

The term data is intended to include software programmes which can be selectively forwarded to the welding device or read from it, providing an effective means of amending configurations, searching for errors and controlling and monitoring the welding device. In particular, all the information or data of a welding process to be run can be fully accessed from the welding device, which enables faulty conditions to be avoided and provides an easy way of assessing the quality and productivity of the welding process. Moreover, it is possible to set up a central control or operating or monitoring system for several welding devices so that the welding engineer can concentrate on his main job since settings can be entered and the welding device monitored from a central point or alternatively from several remote sites. The option of being able to manage and monitor the welding device and the welding processes from a central site or alternatively from several different remote sites allows the system to be automated, which can increase the quality and productivity of welding jobs. Servicing and order processing are simplified in particular and can be operated much more quickly, whilst the welding device can be maintained and configured remotely. Furthermore, online help services can be accessed through the communications interface which means that it will not usually be necessary to stop work or to leave the working area.

The embodiments defined in claims 2 to 4 are of advantage because they provide an easy means of connecting into an already existing or configured network.

The embodiment defined in claim 5 has advantages since it offers a welding device which can be readily adapted to the individual requirements of the user and is also flexible if any changes have to be made subsequently.

An advantage of the embodiment outlined in claim 6 is that it enables the welding device to be connected into data transmission networks covering a wide area, which means that virtually everybody will be able to benefit from the advantages of the welding device proposed by the invention.

With the embodiments defined in claim 7 or 8, welding process data or settings specific to the internal company or worldwide can be transmitted to a specific welding device or from a specific welding device.

Also of advantage is an embodiment as outlined in claim 9, since the welding device may be docked into the primary network or separated from the primary network in full security.

The advantage of the embodiment defined in claim 10 is that the welding device can be connected to standard commercially available PC-compatible components, which means that its functions can be significantly increased whilst reducing on hardware costs.

With the embodiment defined in claim 11, the connection with remote communication partners or communication systems is effected via a tried and tested, very widely used communication means.

The embodiment defined in claim 12 enables welding processes to be monitored seamlessly and influenced at any time. In addition, the welding device may be re-configured or new settings entered using smaller quantities of transmission data in the form of codes. These re-configurations or new settings for the welding device can be handled particularly rapidly, inexpensively and securely since the smallest quantities of data are transmitted in the form of codes used to select specific data and programme packages stored in the memory system of the welding device.

The embodiment defined in claim 13 is of advantage since any stoppages of the welding device due to a lack of operating supplies can be virtually ruled out and data uploads can be left to run automatically, virtually obviating the need for human supervision.

Claim 14 defines an advantageous embodiment which enables the quality and productivity of the welding process to be monitored from globally dispersed sites or at a production site, allowing steps to be taken if necessary to optimise the system.

An embodiment of the type outlined in claim 15 or 16 has been found to be of advantage since the input device can be used for multiple functions and the application of the input device is basically standard so that there is no need for special training.

Claim 17 defines an embodiment which makes it easier for the user to operate the welding device and monitor the welding device.

The embodiment defined in claim 18 has proved to be of advantage since it enables the welding device to be built relatively inexpensively and made ready for use at any time.

An embodiment as defined in claim 19 is of advantage because the software programme is clearly structured and can be divided into a logical programme element and modules for managing and controlling the components of the welding device.

The embodiment described in claim 20 enables the individual software modules to be loaded subsequently at any time and these new software modules to be seamlessly integrated in the programme sequence.

Claim 21 defines an advantageous embodiment which makes it possible to respond very rapidly to safety critical states depending on the respective priority of the states that have occurred or are prevailing.

An embodiment described in claim 22 or 23 is of advantage because a network-optimised programming language is selected, which is independent of the corresponding target hardware and independent of the machine code of the target hardware and can therefore be widely distributed without a knowledge of the target hardware.

An embodiment defined in claim 24 is of advantage because it obviates the need for JAVA interpreters and shortens the system running times.

Claim 25 defines an advantageous embodiment because the welding device is mobile almost without restriction and the connection to the respective network participant or communication device can still be maintained.

An embodiment as outlined in claim 26 or 27 has been found to be of advantage because there is no need for cable connections to integrate the welding device in a primary data network and there is no problem using tried and tested, functionally secure components.

Claim 28 defines an advantageous embodiment since it enables servicing operations, remote analyses, status investigations, configuration changes and similar to be operated in a simple

manner.

The objective of the invention is also independently achieved by a method of operating a welding device as defined by the characterising features of claim 29. The advantage of this approach is that the welding device can be re-configured particularly quickly and very conveniently and the welding process being run on the welding device can be monitored on a fully automated basis, as can monitoring of the status of the welding device itself. Another advantage resides in the fact that the data bases can be centrally maintained, which means that the software modules to be processed are constantly kept up to date. Furthermore, it is an easy matter to store the respective data on a decentralised basis, thereby protecting against loss.

A feature defined in claim 30 is of advantage because the load on the network can be kept very low and the welding device can also be adapted particularly quickly.

An approach as defined in claim 31 or 32 is of advantage, enabling stoppages or down-time of the welding device to be largely avoided and providing a means for assessing the quality and productivity of the welding process from a central site.

A variant of the method defined in claim 33 is of advantage because it ensures that the welding device is provided with operating supplies as and when needed, obviating the need to keep a stock of operating supplies or spare parts for the welding device. Automation also makes the system highly reliable.

Finally, the feature defined in claim 34 is of advantage because the benefits of the welding device proposed by the invention can be used virtually anywhere and by anybody without restriction, which means that it will be widely used and gain a high degree of acceptance.

The objective of the invention is also achieved by the features defined in claim 35.

The advantages of this embodiment will be explained in the description in more detail on the basis of examples of embodiments.

The invention will be described in more detail with reference to the examples of embodiments

illustrated in the appended drawings.

Of these:

Fig. 1 is a very simplified, schematic diagram of a welding device coupled with a primary network for data transmission by wire;

Fig. 2 is a very simplified diagram of a welding device;

Fig. 3 is a very simplified diagram of another embodiment of a welding device;

Fig. 4 is a very simplified diagram of several data processing systems and welding devices networked with one another from globally dispersed sites with an internet connection.

Firstly, it should be pointed out that the same parts described in the different embodiments are denoted by the same reference numbers and the same component names and the disclosures made throughout the description can be transposed in terms of meaning to same parts bearing the same reference numbers or same component names. Furthermore, the positions chosen for the purposes of the description, such as top, bottom, side, etc,. relate to the drawing specifically being described and can be transposed in terms of meaning to a new position when another position is being described. Individual features or combinations of features from the different embodiments illustrated and described may be construed as independent inventive solutions or solutions proposed by the invention in their own right.

Figs. 1 to 4 illustrate a welding system or a welding device 1 for running a whole variety of welding processes, e.g. MIG/MAG welding and TIG or WIG welding. The welding device 1 comprises a current source 2 with a power component 3, a control and/or evaluation unit 4 and a switching element 5 co-operating with the power component 3 or the control and/or evaluation unit 4. Connected to the switching element 5 or the control unit 4 is a control valve 6, disposed in a supply line 7 for a gas 8, in particular an inert gas such as carbon dioxide, nitrogen, helium or argon and such like, between a gas storage 9 and a welding torch 10.

A wire feed device 11 may also be activated via the control and/or evaluation unit 4, in which

case a welding wire 13 will be fed from a supply drum 14 via a supply line 12 into the region of the welding torch 10. The current needed to generate an arc 15 between the welding wire 13 and a workpiece 16 is fed via a supply line 17, 18 from the power component 3 of the current source 2 to the welding torch 10 and the welding wire 13.

Clearly, the wire feed device 11 may also be integrated in the housing of the welding device 1, instead of being provided as a separate device, forming a compact, single-piece unit in the standard manner. Furthermore, in addition to supplying the welding wire 13 from a supply drum 14, it is possible to set up welding devices 1 as proposed by the invention to process bar electrodes. Moreover, the design proposed by the invention may be used on welding devices 1 without fusible electrodes, in particular on welding devices 1 for resistance welding processes or friction welding processes.

Consequently, the design of welding devices 1 proposed by the invention is not dependent on welding methods, nor does it depend on the use of an inert gas atmosphere.

In order to cool the welding torch 10, it may be connected to a water container 21 via a cooling circuit 19, with a flow indicator 20 connected in between, so that when the welding torch 10 is switched on, the cooling circuit 19 is activated by the control and/or evaluation system 4 so that the welding torch 10 and a gas nozzle of the welding torch 10 are cooled. Naturally, it would also be possible to use an external cooling circuit 19, in a manner known from the prior art.

The welding device 1 additionally has an input and/or output device 22, by means of which a whole range of welding parameters or operating modes of the welding device 1 can be set. The welding parameters entered at the input and/or output device 22 are forwarded to the control and/or evaluation unit 4. The individual components of the welding device 1 are activated on the basis of these settings. To this end, it would also be possible for the welding device 1 to be connected to an external input and/or output device 22 which can be switched on as required, such as a computer, a PLC or an operating unit, etc..

The control and/or evaluation unit 4 is connected to at least one communications interface 23, as may be seen more clearly from Fig. 2, so that a two-way data exchange can be run between

the welding device 1 or the current source and a web server, in particular a HTTP server 24, i.e. a communications interface 23 is provided as a means of transferring data to the welding device 1 or from the welding device 1, this system being set up to establish a connection with a web server, in particular a HTTP server 24, either wirelessly or on a hard-wired basis. Consequently, the welding device 1 is set up so that it can at least receive data via the communications interface 23 from a primary network 25 or a data transfer can be run from the primary network 25. By preference, however, the communications interface 23 of the welding device 1 is configured so that electronically processable data can be both received and transferred or transmitted, enabling a two-way data transmission route to be set up between several network participants. If necessary, it would also be conceivable to set up the communications interface 23 so that is can only send or transfer data of the welding device 1 to other participants in the network 25 located at remote sites.

The web server, in particular the HTTP server 24, is disposed in the welding device 1 or the current source 2. Clearly, it would also be possible for the web server, in particular the HTTP server 24, to be disposed externally to the welding device 1 or the current source 2, in particular in a computer or personal computer 26, i.e. a direct connection can be established by connecting the communications interface 23 to an external device, in particular the personal computer 26, a laptop, a networked computer system etc., on the web server, in particular the HTTP server 24, as may be seen from Fig. 3.

The web server, in particular the HTTP server 24, is set up in such a way that it will establish a connection with the primary network 25, in particular the INTERNET and/or an INTRANET, so that data can be exchanged with one of many other web servers, in particular a HTTP server 27 or another communication transmitter linked to the HTTP server 27. This being the case, the other HTTP server 27 may in turn be set up through a welding device 1 with the HTTP server 24 in a manner similar to the embodiments illustrated in Figs. 2 or 3 or the stand-alone personal computer 26. The advantage of operating a data transfer in this manner is that servicing no longer has to be carried out on site. Furthermore, inexpensive adaptations can be made to the welding devices 1, in particular software modifications or software updates, without a service engineer having to be present on site.

The communications interface 23 of the welding device 1 is preferably provided in the form

of an interface to a standard data transmission network, in particular to a hard-wired data transmission network. The welding device 1 may be connected to the primary network 25 by means of a network cable 28, which will establish the electrical connection between the communications interface 23 and the HTTP server 24 and an external network interface 29, in particular a network socket 30.

Instead of providing a hard-wired connection between the welding device 1 and at least one other communication transmission system, it would also be possible to set up a wireless data transmission route. This being the case, the data transmission may be operated by radio via electromagnetic waves or alternatively on an optical basis, preferably using infrared signals. If using optical data transmission, the communications interface 23 will be set up to operate in conjunction with an interface for transmitting and/or receiving infrared signals, having a communication system specifically configured to communicate with an interface for transmitting and/or receiving infrared signals, in particular the interface of a mobile telephone for transmitting and/or receiving infrared radiation. To this end, the HTTP server 24 may be directly integrated in the communications interface 23 or a wireless data connection established with the HTTP server 24. In this case, the welding device 1 or the mobile telephone will be connected to the desired communications transmitter and extended via the public telephone network.

Clearly, it would also be possible to set up the optical communications interface 23 of the welding device 1 to operate with the corresponding optical network interface 29, in which case the corresponding data would be transmitted to the optical network interface 29 wirelessly and then forwarded to the primary network 25 by wire. The transfer of data from the network 25 to the welding device 1 may be operated on a similar basis. The crucial factor if using an optical network interface 29 is to ensure that there is a sight connection between the optical communications interface 23 of the welding device 1 and the optical network interface 29, which can be achieved by positioning the welding device 1 accordingly.

If data transfers are operated on the basis of an optical or electromagnetic system via a mobile telephone with an interface for transmitting and/or receiving infrared radiation, it will merely be necessary to set up the dial-up connection to the desired communication transmission system and link the interface of the mobile telephone for transmitting and/or sending infrared ra-

diation to the optical communications interface 23 on the welding device 1 and initiate the desired connection structure.

The primary network 25 may be set up to operate through an electrical network 25 only or alternatively through an optical network for transmitting optical signals, to take advantage of high data transmission rates and low susceptibility to interference from electromagnetic fields.

The network 25 set up to communicate between several network participants or communication devices may be based on a local area network 31 (LAN) internal to the company and/or on a global network 32 linking various sites (WAN). It would also be possible to link the local area network 31 into the wide area network 32 or to couple the networks 31, 32 with one another.

For transferring data to the local area network 31, it is preferable to use standardised TCP (Transmission Protocol) or IP (Internet Protocol) as the communication protocols. Accordingly, the communications interface 23 of the welding device 1 is a TCP/IP interface. The local area network 31 is therefore preferably set up as an INTRANET network or another network built on the TCP/IP protocol system. For example, the network 25 might be set up as an ETHERNET or ARCNET system.

As may be more clearly seen from Figs. 1 to 4, the welding device 1 can be connected via the communications interface 23 and the HTTP server 24, 27 into the wide area network 32 either directly or indirectly via the local area network 31. The communications interface 23 is therefore designed to link into an INTRANET 33 and/or directly into the INTERNET 34. The wide area network 32 is preferably based on the known INTERNET 34 which enables communication with any communications devices distributed worldwide but selectively addressable, all having HTTP servers 24, 27, through the TCP/IP protocol.

Fig. 4 in particular provides a very simple illustration of one possible communications set-up between several welding devices 1 and other network participants or other communication devices.

The control and/or evaluation unit 4 of the welding device 1 may be or incorporate a standard,

commercially available computer unit 35, in particular a personal computer 36. The computer unit 35 or personal computer 36 in the welding device 1 will have the standard communications interface 23 with the HTTP server 24 for communicating with freely selectable communication devices also fitted with the HTTP server 24 or 27 in the primary network 25.

The various welding devices 1 and network participants 37 are deployed at globally distributed user sites 38 to 43, it also being possible for a plurality of welding devices 1 and network participants 37 at the respective user sites 38 to 43 to communicate with one another.

Each of the user sites 38 to 40 has a respective local area network 31, to which the welding devices 1 and other network participants 37 are linked and therefore able to exchange data with one another.

By network participants 37 is meant conventional personal computers 44, data storage systems 45, simple data display units 46 such as terminals and automation systems 47 or programmable logic controllers (PLC) for automating any technical or industrial process sequences. The automation systems 47 will have a plurality of inputs and/or outputs via which the process to be automated can be monitored and controlled. Conventional field bus systems 48 will be used to connect the automation system 47 to the devices to be controlled. This being the case, the automation system 47 may control a welding robot, in which case the welding device 1 will the welding robot.

Similarly, the welding device 1 may also have a sensor system 49, by means of which data relevant to a welding process can be detected during operation and forwarded to the welding device 1. The sensor unit co-operating with the welding device 1 may be designed to detect the welding current rating, temperature conditions, the burning depth, the characteristic features of the arc, guiding of the welding torch and similar. The welding process data picked up by the sensor system 49 used for assessing the quality or a welding process or for detecting current welding performance is transferred to the welding device 1, where it is prepared or optionally processed and can then be despatched to other network participants for evaluation via the communications interface 23 and the HTTP server 24 or selectively retrieved by other network participants 37, such as the personal computer 44 for example.

The local area networks 31 at the individual user sites 38 to 40 may be protected against external unauthorised access by means of a data protection device 50, known as a Firewall. This data protection device 50 is also designed to prevent unauthorised persons from entering data in the network 31 or in the welding devices 1 or network participants 37.

The welding devices 1 or the local area networks 31 are linked into the worldwide internet 34 via appropriate access systems 51, in particular what are known as Internet service-providers. A clearly distinguishable code or address 52 is allocated to each welding device 1 or each network participant 37 so that the respective welding device 1 or the respective network participant 37 can be selectively contacted or called as well as unambiguously identified from a plurality of welding devices 1 or network participants 37 if data is being downloaded. The address 52 or the so-called e-mail address is managed by the Internet service providers or by the respective access system 51 to the internet 34.

The control and/or evaluation system 4of the welding device 1 is preferably provided in the form of a processor control, which operates on the basis of a predetermined sequential programme. The sequential programme may be made up of a plurality of software modules which together form the complete control programme. The control and/or evaluation unit 4 is set up to run the software modules in cycles and/or on an interrupt-controlled basis.

The software modules to be run by the control and/or evaluation system 4 may be permanently or temporarily stored in a memory system 53 of the welding device 1. This being the case, the memory system 53 may be made up of digital technology memory modules, a hard disk storage or other known data memory systems known from the prior art. In addition to the software modules to be run, process data or intermediate results of the processor control and pre-set characteristics may also be permanently or temporarily stored in the memory system 53.

It will then be possible, via the communications interface 23 or through the link into the network 25, to read data or software modules from the welding device 1 or transfer them to the welding device 1. In particular, the software modules to be run by the control and/or evaluation system can be replaced by new software modules transferred via the network 25. Consequently, once updated with the new software modules, the welding device 1 can be run on the basis of another sequential programme. This means that it will now be possible for other or

modified functions to be set up on the welding device 1 via the network 25, thereby establishing a system of remote control or remote operation of the welding device 1.

Similarly, it is also possible to store a plurality of software modules or control programmes in the memory system 53 and selectively activate a new control programme on the basis of codes received via the network 25, which can then be run by the control and/or evaluation unit 4.

Similarly, data updates can be transferred across the network 25 to the welding device 1, these updates being activated from a remotely located site.

Through software updates and by transferring codes, it will therefore be possible to add to or reduce the functions of the welding device 1 . For example, software modules updated to incorporate functions requested by the manufacturer of the welding device 1 can be transferred to the respective welding devices 1 at the customer sites and integrated in the control and/or evaluation unit 4 of the welding device 1. If the welding device 1 is incorporated in the network 25, the output capacity of the welding device 1 can be easily increased by the manufacturer, once the corresponding owner of the welding device 1 has settled the requisite fees. The capacity can be altered in many ways simply by adapting the control programme, so that various classes of output can be achieved with a specific hardware configuration advantageously enabling the manufacturer to increase the number of products processed without any detrimental effect on the number of types.

Likewise, remote maintenance operations can be run on globally distributed welding devices 1 from a central site or from a manufacturing site of the welding device 1. In particular, remote diagnosis, remote error-searching and servicing or status checks of the welding device 1 can be operated remotely. Consequently, the reliability of the welding device and the quality of the welding processes operated with the welding device 1 can be guaranteed and stoppages of the welding device 1 prevented since faults can be detected early.

On the other hand, it would also be possible to forward all data for individual welding parameters or codes for an individual configuration of the welding device 1 via the network 25 and the communications interface 23 or read off this data from the welding device 1 in order to control the welding processes. Data relating to the operation of the welding device 1, such

as the duration of use, operation timing, the welding settings or similar, can be retrieved by a network participant 37 or this data can be automatically transferred from the welding device 1 to other network participants 37 for processing or evaluation.

Likewise, it would also be possible to retrieve data relating to the operating supplies for the welding device 1, e.g. the quantity and/or the nature of the welding electrodes, the fusible welding wire 13, the inert gases used and similar, to be transferred via the sensor system 49 co-operating with the welding device 1 across the network 25 and the communications interface 23 or automatically transferred from the control and/or evaluation unit 4 to other network participants 37 for evaluation and a decision as to whether steps need to be taken. Data relating to parts of the welding device 1 susceptible to wear, e.g. the contact sleeve, the gas nozzle or similar, can also be selectively retrieved via the sensor system 49 across the network 25 or transmitted to at least one other network participant 37 either periodically or before a critical state is reached, enabling appropriate steps to be taken.

By networking the welding device 1 and by providing the sensor system 49, the control and/or evaluation unit 4 will also be able to make service recommendations or specify desired service times and specific service requirements. Furthermore, automatic messages about stocks of operating supplies or specific orders for operating supplies can be sent by the welding device 1 to specific network participants 37, e.g. a gas or welding wire supplier.

Data and software modules are preferably transmitted from the welding device 1 to the respective network participant 37 with a specific address 52 or vice versa via the INTRANET 33 within site-related regions or worldwide via the INTERNET 34.

In order to link the welding device 1 to the primary network 25, in particular the INTERNET 34, the control and/or evaluation unit 4 or its computer unit 35 has a standardised communications interface 23. The welding device 1 is connected via this communications interface 23 to a coupling device 54 in the form of an external or internal modem 55 or alternatively by an appropriate network card 56, for example.

If using an external modem 55 in particular, the standardised communications interface 23 of the welding device 1 or its computer unit 35 will be a serial interface, in particular a RS 232

interface.

An external communication can be set up across the network 25 by means of the coupling device 54 in the form of the modem 55 or the network card 56 provided in the welding device 1. The coupling device 54 provided in the welding device 1 in the form of the modem 55 can be used to establish an external connection or to make a dial-up connection across the telephone network for a reliable data transfer or to exchange data over a large area.

The welding device 1 is operated and/or controlled from the input and/or output device 22, in which case an input device 57 is provided as standard and an output device 58 may be provided as an option. Operation of the input and/or output device 22 may be menu-driven so that the user will not need any previous special knowledge of the system in order to be able to make a transfer over the INTERNET 34 or the INTRANET 33.

The input device 57 enables the welding device 1 to be operated and/or navigated in order to select specific data from the data base of a welding technology data bank 59. This technical data bank 59 may form part of the filing system of a remotely located data bank driver or alternatively may be a technical data bank 59 within the company containing data primarily relating to welding.

The input device 57 may have standard components such as a keyboard, a pointer device, a push-stick type control element or several operating elements in the form of rotating and/or sliding elements with keying and/or switching functions.

The optional output device 58 may also have standard components such as a monitor, a display or similar. Data retrieved from the primary network 25 and/or data managed by the control and/or evaluation unit 4 and/or data entered from the input unit 57 may be viewed using this output device 58. In addition or alternatively, the output device 58 may also have acoustic means so that relevant data or statuses can be indicated by signals.

The primary advantage of using the personal computer 36 as the control and/or evaluation unit 4 of the welding device 1 is that standard input and/or output devices 22 can be used, such as monitors and keyboards.

Similarly, a combined input and output device 22 may be used with the welding device 1, for example in the form of a touch screen, which will make it much easier for the welding engineer to use or adjust the welding device 1, whilst keeping space requirements to a minimum.

The control and/or evaluation unit 4 or the personal computer 36 of the welding device 1 has a sequencing system software module or a corresponding operating system. The software modules to be run by the computer unit 35 or the personal computer 36 of the welding device 1 are preferably of the object-oriented type. The software module for the sequencing system or operating system is designed to integrate the object-oriented software modules in the control programme. This being the case, the HTTP servers 24, 27 may also be based on a software module of this type, in which case this software module will be activated by the control and/or evaluation unit 4 in readiness for a data transmission enabling corresponding data to be received by or transmitted from the welding device 1.

The sequencing system software module may be stored in an EPROM memory module. Unlike hard disks, this non-volatile memory system 53 does not use magnetic data recording so that the likelihood of it causing interference, particularly in strong electromagnetic fields, e. g. in welding fields, is very low. Similarly, intermediate results or process data of the welding device 1 may be stored in a memory system 53 provided in the form of a RAM memory and/or EEPROM memory.

The control programme run by the control and/or evaluation unit 4 is preferably written using a programming language specially designed for network applications. The control programme and its software modules are preferably written in JAVA source language. In order to translate the JAVA source code, the control and/or evaluation unit 4 or the computer unit 35 of the welding device 1 will have a JAVA interpreter. This JAVA interpreter translates the JAVA source code into a format that can be processed by the target hardware, in other words the control and/or evaluation unit 4.

Optionally, the processor of the control and/or evaluation unit 4 or the computer unit 35 may be a JAVA processor, which will process the control programme written in JAVA directly.

As may best be seen from Fig. 1, the communications interface 23 of the welding device 1

may also be set up in the form of a wireless communications interface 23. This wireless communications interface 23 of the welding device 1 is designed to communicate with a mobile telephone 60, as explained earlier. The communications interface 23 is preferably an infrared interface 61 for transmitting and/or receiving infrared signals 62 representing the respective data. If the communications interface 23 is provided as an infrared interface 61, it will be set up in such a way that it is able to connect with the mobile telephone 60, in particular with an infrared interface 63 of the mobile telephone 60. A two-way or alternatively only a one-way data transmission route 64 can be set up between the infrared interface 61 of the welding device 1 and the infrared interface 63 of the mobile telephone 60, via which the respective data can be transmitted in the form of infrared signals 62. Clearly, it would also be possible for the mobile telephone 60 or a wireless modem to be integrated in the welding device 1 itself, enabling a connection to be set up at any time and at any site without the need for additional elements such as connecting cables or an additional mobile telephone 60.

The welding device 1 is connected to the primary network 25 via the mobile telephone 60, a dial-up connection being made across the public or a private telephone network to the respective communication transmission system or communication partner. It would also be possible to establish a direct connection with a communication partner without the primary network 25, for which purpose a data connection will be established between the two HTTP servers 24 and 27.

The respective welding process data, data for the parameter settings and software modules in this case are transmitted via electromagnetic waves 65, which can be emitted and received by the mobile telephone 60. The transmission of data between the mobile telephone 60 and the respective communication transmission system or communication partner may be made across a very large distance in a known manner.

The connecting structure between the mobile telephone 60 and the communication transmission system or communication partner is preferably initiated manually by the user of the welding device 1 using the keypad of the mobile telephone 60 to make a dial-up connection. The dial-up connection may optionally be to a servicing department, suppliers of operating equipment, technical data banks 59 and welding data banks containing the respective welding settings for the impending welding process or similar.

Instead of the mobile telephone 60, it would also be possible to use a stationary transmitter and/or receiver unit 66 mounted and installed in the welding device 1 as a means of transmitting and /or receiving electromagnetic waves 65.

As may best be seen from Fig. 4, a programming and/or data display unit 67 may optionally be connected to the welding device 1 or be placed in contact with it via the network 25. This programming and/or data display unit 67 is designed for entering data into the welding device 1 and/or for outputting and displaying data from the welding device 1. The programming and/or display unit 67 may also be linked into the primary network 25 so that a specific welding device 1 may be selected and called via the INTERNET 34 using its address 52. The programming and/or display unit 67, provided as a stand-alone unit, may also be directly connected to the welding device 1 via the communications interface 23. Furthermore, the programming and/or display unit 67 may also be used as a means of taking readings of faults and/or carrying out maintenance.

For the sake of good order, it should finally be pointed out that in order to provide a clearer understanding of how the welding device is built, it and its constituent parts are illustrated out of proportion and/or on an enlarged scale and/or on a reduced scale.

The objective of the invention and the independent inventive solutions proposed by the invention may be found in the description.

Above all, the individual embodiments illustrated in Figs. 1, 2, 3, 4 may be construed as the subject matter of independent solutions proposed by the invention in their own right. The objectives and solutions proposed by the invention may be taken from the detailed descriptions of these drawings.

List of reference numbers

1	Welding device	26	Personal computer
2	Current source	27	HTTP server
3	Power component	28	Network cable
4	Control and/or evaluation system	29	Network interface
5	Switching element	30	Network socket
6	Control valve	31	Network (LAN)
7	Supply line	32	Network (WAN)
8	Gas	33	INTRANET
9	Gas storage	34	INTERNET
10	Welding torch	35	Computer unit
11	Wire feed device	36	Personal computer
12	Supply line	37	Network participant
13	Welding wire	38	User site
14	Supply drum	39	User site
15	Arc	40	User site
16	Workpiece	41	User site
17	Supply line	42	User site
18	Supply line	43	User site
19	Cooling circuit	44	Personal computer
20	Flow indicator	45	Data storage system
21	Water container	46	Data display unit
22	Input and/or output device	47	Automation system
23	Communications interface	48	Field bus system
24	HTTP server	49	Sensor system
25	Network	50	Data protection system

51 Access system
52 Address
53 Memory system
54 Modem
55 Modem

56 Network card
57 Input device
58 Output device
59 Technical data bank
60 Mobile telephone

61 Infrared interface
62 Infrared signal
63 Infrared interface
64 Data transmission route
65 Waves (electromagnetic)

66 Transmitter and/or receiver unit
67 Programming and/or data display unit